

What is claimed is:

1. A gas replacement method comprising:
  - exhausting a gas from a closed chamber which accommodates a substrate with which a thin film is provided; and
  - adjusting an exhaust amount of said gas from said closed chamber so that deformation of said thin film due to the exhaust is within a predetermined range.
2. A gas replacement method according to claim 1, further comprising:
  - measuring said deformation of said thin film; and
  - adjusting said exhaust amount based on a result of the measurement.
3. A gas replacement method according to claim 1, further comprising:
  - measuring a pressure in said closed chamber; and
  - adjusting said exhaust amount based on a result of the measurement.
4. A gas replacement method according to claim 1, further comprising supplying a replacement gas into said closed chamber, wherein
  - when supplying a replacement gas into said closed chamber, at least one of a supply amount of said replacement gas and said exhaust amount is adjusted so that deformation of said thin film due to the supply of said replacement gas is within a predetermined range.
5. A gas replacement method comprising:
  - exhausting a gas from a space formed between a substrate and a thin film provided with said substrate; and
  - adjusting an exhaust amount of said gas from said space so that deformation of said thin film due to the exhaust is within a predetermined range.
6. A gas replacement method according to claim 5, further comprising supplying a replacement gas into said space, wherein
  - when supplying a replacement gas into said space, at least one of a supply amount of said replacement gas and said exhaust amount is adjusted so that deformation of said

thin film due to the supply of said replacement gas is within a predetermined range.

7. A gas replacement method comprising:

replacing a gas in a space formed between a substrate and a thin film provided with said substrate with a predetermined gas; and  
detecting deformation of said thin film when replacing said gas.

8. A gas replacement method according to claim 7, further comprising adjusting an amount of said gas to be exhausted from said space based on deformation of said thin film.

9. A gas replacement method according to claim 8, further comprising adjusting an amount of said predetermined gas to be supplied into said space based on said deformation of said thin film.

10. A gas replacement apparatus comprising:

a closed chamber which accommodates a substrate with which a thin film is provided;  
an exhaust device which is connected to said closed chamber and exhausts a gas from said closed chamber;  
a deformation measuring device which is associated with said thin film and measures deformation of said thin film; and  
a control system which is connected to said deformation measuring device and adjusts an exhaust amount of said gas based on a result of the measurement so that said deformation of said thin film is within a predetermined range.

11. A gas replacement apparatus according to claim 10, further comprising a gas supply device which is connected to said closed chamber and supplies a replacement gas into said closed chamber; and

wherein said control system adjusts at least one of a supply amount of said replacement gas and said exhaust amount of said gas from said closed chamber so that said deformation of said thin film is within said predetermined range.

12. A gas replacement apparatus comprising:

a closed chamber which accommodates a substrate with which a thin film is provided;

an exhaust device which is connected to said closed chamber and exhausts a gas from said closed chamber;

a pressure measuring device which is provided with said closed chamber and measures a pressure in said closed chamber; and

a control system which is connected to said pressure measuring device and adjusts an exhaust amount of said gas based on a result of that measurement so that said deformation of said thin film is within a predetermined range.

13. A gas replacement apparatus according to claim 12, further comprising a gas supply device which is connected to said closed chamber and supplies a replacement gas into said closed chamber; and

wherein said control system adjusts at least one of a supply amount of said replacement gas and said exhaust amount of said gas from said closed chamber so that said deformation of said thin film is within said predetermined range.

14. A gas replacement apparatus comprising:

an exhaust device which is connected to a space formed between a substrate and a thin film to be provided with said substrate and exhausts a gas from said space;

a deformation measuring device which is provided in association with said thin film and measures deformation of said thin film; and

a control system which is connected to said deformation measuring device and adjusts an exhaust amount of said gas based on a result of that measurement so that said deformation of said thin film is within a predetermined range.

15. A gas replacement apparatus according to claim 14, further comprising a gas supply device which is connected to said space and supplies a replacement gas into said space; and

wherein said control system adjusts at least one of a supply amount of said replacement gas and said exhaust amount so that said deformation of said thin film is within said predetermined range.

16. A gas replacement apparatus comprising:

a gas replacement device which is connected to a space formed between a substrate and a thin film provided with said substrate and replaces a gas in said space with a predetermined gas; and

a deformation measuring device which is associated with said thin film and measures deformation of said thin film.

17. A gas replacement apparatus according to claim 16, wherein said gas replacement device adjusts an amount of said gas to be exhausted from said space based on a result of measurement from said deformation measuring device.

18. A gas replacement apparatus according to claim 17, wherein said gas replacement device adjusts an amount of said predetermined gas to be supplied into said space based on a result of measurement from said deformation measuring device.

19. An exposure method comprising:

accommodating a mask, on which a protection member is provided via a frame, in a closed chamber having at least one of a first space including an optical path of exposure light and a second space adjacent to said first space;

replacing a gas in said closed chamber with a predetermined gas having low absorption characteristic with regard to exposure light;

replacing a gas in a space formed between said protection member and said mask with said predetermined gas according to replacing the gas in said closed chamber; and

irradiating said exposure light onto said mask after the gas replacement and transferring an image of a pattern of said mask onto a substrate.

20. An exposure method according to claim 19, wherein, when replacing said gas in said closed chamber with said predetermined gas, an exhaust amount of said gas from said closed chamber is adjusted so that deformation of said protection member originated from exhausting of said gas is within a predetermined range.

21. An exposure method according to claim 20, wherein said exhaust amount of said gas from said closed chamber is adjusted so that deformation of said protection member is

within a predetermined range.

22. An exposure method according to claim 21, wherein said predetermined gas is supplied into said closed chamber so that deformation of said protection member is within a predetermined range.

23. An exposure method according to claim 19, wherein, when replacing said gas in said closed chamber with said predetermined gas, an exhaust amount of said gas from said closed chamber is adjusted based on a change in pressure in said closed chamber.

24. An exposure method comprising:

accommodating a mask on which a protection member is provided via a frame in a closed chamber having at least one of a first space including an optical path of exposure light and a second space adjacent to said first space;

replacing a gas in a space formed between said protection member and said mask with a predetermined gas in said closed chamber; and

after said gas in said space formed between said protection member and said mask is replaced with said predetermined gas, irradiating said exposure light onto said mask and transferring an image of a pattern of said mask onto a substrate.

25. An exposure method according to claim 24, wherein said gas in said space formed between said protection member and said mask is replaced with said predetermined gas via a plurality of holes formed in said frame.

26. An exposure apparatus comprising:

a closed chamber which accommodates a mask on which a protection member is provided via a frame, said closed chamber having at least one of a first space including an optical path of exposure light and a second space adjacent to said first space;

a gas replacement apparatus which is provided with said closed chamber and replaces a gas in said closed chamber with a predetermined gas having low absorption characteristic with regard to exposure light; and

a deformation measuring device which is associated with said protection member and measures deformation of said protection member.

27. An exposure apparatus according to claim 26, wherein said gas replacement apparatus comprises:

an exhaust device which exhausts a gas from said closed chamber; and  
a control device which is connected to said deformation measuring device and controls exhausting of said gas from said closed chamber by said exhaust device based on a result of measurement from said deformation measuring device so that said deformation of said protection member is within a predetermined range.

28. An exposure apparatus according to claim 27, wherein said gas replacement apparatus comprises a gas supply device which supplies said predetermined gas into said closed chamber; and

said control device controls supply of said predetermined gas into said closed chamber by said gas supply device so that said deformation of said protection member is within a predetermined range.

29. An exposure apparatus comprising:

a closed chamber which accommodates a mask on which a protection member is provided via a frame, said closed chamber having at least one of a first space including an optical path of exposure light and a second space adjacent to said first space;

a gas replacement apparatus which is provided with said closed chamber and replaces a gas in said closed chamber with a predetermined gas having low absorption characteristic with regard to exposure light;

a pressure measuring device which is provided with said closed chamber and measures a pressure in said closed chamber; and

a control device which is connected to said pressure measuring device and controls said gas replacement apparatus based on a result of measurement from said pressure measuring device so that said deformation of said protection member is within a predetermined range.

30. An exposure apparatus according to claim 29, wherein said gas replacement apparatus comprises an exhaust device which exhausts a gas from said closed chamber; and

said control device controls exhausting of said gas from said closed chamber by

said exhaust device so that said deformation of said protection member is within a predetermined range.

31. An exposure apparatus according to claim 30, wherein said gas replacement apparatus comprises a gas supply device which supplies said predetermined gas into said closed chamber; and

said control device controls supply of said predetermined gas into said closed chamber by said gas supply device so that said deformation of said protection member is within a predetermined range.

32. An exposure apparatus comprising:

a closed chamber which accommodates a mask on which a protection member is provided via a frame, said closed chamber having at least one of a first space including an optical path of exposure light and a second space adjacent to said first space;

a gas replacement apparatus which is provided with said closed chamber and replaces a gas in a space formed between said protection member and said mask with a predetermined gas having low absorption characteristic with regard to exposure light; and

a deformation measuring device which is associated with said protection member and measures deformation of said protection member.

33. An exposure apparatus according to claim 32, wherein said gas replacement apparatus is disposed in said space adjacent to said space including said optical path of said exposure light.

34. An exposure apparatus according to claim 33, wherein said gas replacement apparatus comprises an exhaust device which is connected to said frame and exhausts said gas from said space formed between said protection member and said mask, and a gas supply device which is connected to said frame and supplies said predetermined gas into said space formed between said protection member and said mask.

35. An exposure apparatus according to claim 34, further comprising a control apparatus which is connected to said deformation measuring device and controls at least one of supply of said predetermined gas into said closed chamber by said gas supply device and

exhausting of said gas from said closed chamber by said exhaust device so that said deformation of said protection member is within a predetermined range.

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